

Acquisition of Literacy in Bilingual Children: A Framework for Research

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Much of the research that contributes to understanding how bilingual children become literate is not able to isolate the contribution of bilingualism to the discussion of literacy acquisition for these children. This article begins by identifying three areas of research that are relevant to examining literacy acquisition in bilinguals, explaining the contribution of each, and associating each type of research with a skill required by monolingual children in becoming literate. Three prerequisite skills for the acquisition of literacy are competence with the oral language, understanding of symbolic concepts of print, and establishment of metalinguistic awareness. A review of the literature explores the extent to which these skills that influence literacy acquisition in monolinguals develop differently for bilingual children. The conclusion is that the relation between bilingualism and the development of each of the three skills is different, sometimes indicating an advantage (concepts of print), sometimes a disadvantage (oral language competence), and sometimes little difference (metalinguistic concepts) for bilingual children. Therefore, bilingualism is clearly a factor in children's development of literacy, but the effect of that factor is neither simple nor unitary.

Since the publication of this article, our research has continued to explore the themes set out in this framework and provided more detail for the description of how bilingualism affects the acquisition of literacy. Two important advances in this research are the finding that some aspects of reading ability, notably phonological awareness, are rooted in general cognitive mechanisms and transfer easily across languages, whereas others, such as decoding, are more language dependent and language-specific and need to be relearned with each new writing system (Bialystok, Luk, & Kwan, 2005). Second, writing systems and the differences between them have a greater impact on children's acquisition of literacy than previously believed. Not surprisingly, this relation has been found for emerging ability with phonological awareness (Bialystok, McBride-Chang, &

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Luk, 2005) but, more surprisingly, has recently been shown to have a subtle influence on children's emerging concepts of print (Bialystok & Luk, in press).

The interpretation that bilingualism must be considered in terms of both advantages and disadvantages has also been pursued in studies of cognitive and linguistic processing in adults. Recent research has shown that adult bilinguals display disadvantages on tasks measuring lexical retrieval and fluency (Michael & Gollan, 2005) but advantages on tasks assessing cognitive control of attention (Bialystok, Craik, Klein, & Viswanathan, 2004). This approach leads to a more detailed and, ultimately, more accurate description of how bilingualism affects cognitive performance.

Keywords Literacy acquisition, bilingualism, oral proficiency, concepts of print, metalinguistic awareness

For almost a century, there has been a small but consistent research interest in the possible implications that bilingualism might have on children's cognitive and intellectual development (reviewed by Hakuta, 1986). Much of this research was conducted in schools, using school-type measures of achievement (e.g., Macnamara, 1966) and often including standardized IQ testing (e.g., Saer, 1923). The research reflects a concern with the academic component of children's development, and perhaps even a presumed association between academic success and cognitive maturity. Conclusions from this literature have passed through phases of rejection and support of bilingualism as a positive childhood experience, but the question has persisted as though unresolved, and the concern regarding children's academic achievement has remained salient. Undoubtedly, part of the motivation for keeping these questions on a research agenda in spite of definitive pronouncements at various points in time is the practical concern of parents for the well-being of their children: If bilingualism impacted on children's development, they would want to know that. It is particularly surprising, therefore, that during the long history of such studies, little research has directly investigated the impact of bilingualism on the supreme achievement of schooling and its most indelible academic legacy: the acquisition of literacy.

Studies that appear to address the role of bilingualism in literacy acquisition are generally concerned with related issues and not bilingualism itself as the potentially significant developmental factor. Many, for example, address the problem of learning to read in a second language, a related but different issue. The matter is complicated by the logical confound that being bilingual makes it inevitable that learning to read includes learning to read in a second language. However, if we are to isolate the role of bilingualism in acquiring this particular cognitive skill, then the concern must be with reading, not with the language in which literacy is acquired.

The research can be grouped into three categories, each addressing a different issue: (a) the acquisition of literacy by bilingual (or partially bilingual) children (or adults) in a weak language, (b) the acquisition of literacy by monolingual children in different languages, and (c) the cognitive and linguistic components of fluent reading in a second language. All of these provide insights into understanding the acquisition of reading by bilingual children, but none of them isolates the contribution of bilingualism itself to the initial development of literacy skills. Further, each research paradigm identifies a skill that is part of the background for the acquisition of literacy by bilingual children and corresponds to a skill known to support the acquisition of literacy by monolingual children. These skills, then, can be examined for potential effects that bilingualism has on their development, enabling an evaluation about possible differences between monolingual and bilingual children in their efforts at learning to read.

The first research issue is the acquisition of literacy in a weak language. Much of this research has been conducted from the perspective of educational policy by studying children for whom the language of schooling is not the same as the language of the home. In the United States, the primary group affected by these conditions is Hispanic children who acquire English language literacy in school in spite of having a weak command of spoken English. These children typically achieve lower levels of reading competence than do their peers (August & Hakuta, 1997) and require between 4 and 7 years to reach grade-level standards in academic and literacy achievement (Collier, 1987; Cummins, 1991; Hakuta, Butler, & Witt, 2000). Although better than their literacy skills, the oral language skills of these children also lag behind those of their monolingual peers and are estimated to require between 2 and 5 years to achieve age norms. More important, however, is that the social and educational background of these children may compromise their ability to acquire literacy, irrespective of language proficiency.

Sometimes acquisition of literacy in a weak language takes place in a context that is socially and educationally supportive. Immersion programs in which English-speaking children are educated in French (e.g., Swain & Lapkin, 1982) or Hebrew (e.g., Geva & Siegel, 2000) are examples of this situation. Nonetheless, these children again are only marginally bilingual and are typically exposed to the oral and written forms of their second language simultaneously. For example, Geva, Wade-Woolley, and Shany (1997) compared speed and accuracy for first- and second-grade children reading in both English and Hebrew. When testing began, children had received 6 months of half-day school instruction in Hebrew, a limited exposure by any standard. The results were complex, but the patterns of transfer across languages indicated that the most decisive variable

in children's literacy attainment was individual differences in reading ability, irrespective of language. These children are learning literacy skills in a weak language at the same time as they are learning to read in their strong language, and the transfer of skills from the dominant language facilitates literacy in the weaker language, obscuring any effect that bilingualism *per se* might have imparted. Instead, individual differences in reading ability monopolize the variance. Although we have much to learn from these studies, they do not directly address the question of the potential impact that the early childhood experience of constructing two language systems might have on children's ability to translate those competencies into literacy.

Other research in this first category focuses more explicitly on the sociolinguistic perspective and delineates the contextual factors that support (or fail to support) children's acquisition of literacy in a second language. An excellent collection of these descriptive studies is presented by Durgunoğlu and Verhoeven (1998). These studies help to locate the acquisition of literacy in a framework that includes details about how the second language is used, pointing to clear relations between language experience and the probability that children will acquire its literate forms. Both proficiency and opportunities for use contribute to children's acquisition of literacy in a second language.

The second category of studies investigates how monolingual children who are speakers of different languages learn to read in their respective native language (e.g., collection by Harris & Hatano, 1999). The analyses include descriptions of the language structure, type of writing system, and nature of the orthography to explain how reading is acquired. The assumption is that details of these structures and their interactions in orthography determine the prerequisite skills children require and the ease with which reading can be acquired for that specific language. For example, Wimmer and his colleagues compared the ability of (monolingual) English- and German-speaking children learning to read and spell (Frith, Wimmer, & Landerl, 1998; Wimmer & Goswami, 1994). German is the more regular language and German-speaking children performed better on all tasks. Similarly, Bentin, Hammer, and Cahan (1991) examined the relation between phonological awareness and literacy for children who were learning to read Hebrew, a language in which the correspondences between sounds and symbols are very regular. Again, these children progressed more rapidly than did children learning to read in English. Some language-specific differences follow from familiarity with the oral forms of different languages irrespective of the writing system in which they are recorded. Huang and Hanley (1995) showed that English-speaking children were better than Chinese-speaking children in deleting a sound from a consonant-vowel (CV) combination, but that

Chinese-speaking children were better in deleting a sound from a consonant cluster such as CCV. These patterns reflect differences in the syllabic structure of the languages, ironically endowing Chinese-speaking children with a skill more useful in reading alphabetic scripts, namely phoneme isolation.

These studies set important limits on the generalizations that describe children's access to literacy by identifying the correspondences of phonology and orthography that are unique to each language and enable reading in each. Goswami (1999) provided a good summary of these issues by describing the relationships among different orthographies, different languages within orthographies, and the nature of phonological skills children need to develop to read in each of them. Bilingualism, therefore, will play a role in learning to read if these language-specific skills transfer across languages. Thus, bilingual children may benefit through transfer or delay through interference when learning to read in one of their languages. Some of these language-specific effects that follow from learning to read two orthographically dissimilar languages were discussed by Geva and Siegel (2000).

The third category of studies evaluates the cognitive processes involved in fluent reading in a second language. These include the contribution of linguistic knowledge of the second language, literacy knowledge from the first language, and conceptual knowledge of the material (Bernhardt, 1991; Durgunoğlu, 1997; Haynes & Carr, 1990; Koda, 1994). For example, Segalowitz (1986) has shown that even for individuals with high levels of oral proficiency there are differences in reading speed and reading efficiency for adult bilinguals reading in their second language. Durgunoğlu (1997) reported more reliable correlations between second-language reading proficiency and literacy knowledge in the first language than between second-language reading proficiency and oral knowledge of the second language, suggesting that these factors are even more important than oral proficiency in the language of reading. Additionally, research by Koda (1989, 1990) has demonstrated the pervasiveness with which adult readers transfer strategies across languages. Specifically, adults skilled in reading nonalphabetic orthographies such as Japanese transfer their holistic strategies to reading alphabetic languages such as English. Skilled reading in these different systems entails different processes, and these processes are transferred to other languages irrespective of their fit with those systems. For writing systems that require different reading strategies, the transfer of strategies from another language is not always felicitous.

Some of this research on the cognitive components of fluent reading been conducted with children. In a review of research examining factors that determine children's ability to acquire literacy in a second language, Geva and her

colleagues (Geva & Siegel, 2000; Geva & Wade-Woolley, 1998) evaluated two apparently competing proposals. The first is that the acquisition of literacy is propelled by general cognitive and linguistic development, making literacy levels equivalent in all of the child's languages; the second is that literacy emerges out of specific knowledge of the linguistic forms and orthographic principles of individual languages and is unique to each of the child's languages. Factors such as orthographic depth, for example, determine what strategies children will need to use when learning to read the language and the success they will achieve as they acquire these skills. They concluded that both sources contribute importantly to children's developing proficiency with written text. This conclusion validates the need for all three types of research discussed above but leaves unsolved the issue of how bilingualism may influence the development of any of the necessary skills.

These three types of research all contribute to the larger issue of how bilingualism as an isolated variable might fit into the equation that determines how children learn to read. However, their applicability to this discussion is limited by three factors. The first is that the limited command of the second language by some groups means that the participants are not necessarily bilingual (first and second group); the second is that the participants are not always children (third group); and the third is that some participants (both adults and children) have already acquired basic literacy concepts in another language (first and third group). Therefore, although all of these studies are important, they do not explain how young bilinguals establish the insights that enable them to become literate.

When children learn to read, there is an epiphanic moment in which they realize that text represents meanings. This insight sets the stage for children to learn about the formal structures that are the key to uncovering those meanings. There is a substantial literature that describes this process for monolingual children (review in Adams, 1990) but surprisingly little investigation of how the knowledge of two languages creates a different stage on which it unfolds for bilingual children. Each of the three types of study described above contributes some piece to the puzzle. The studies investigating children learning to read in a weak language highlight the importance of oral language proficiency; the studies comparing reading acquisition in different languages point to the specific concepts of spoken and written forms needed to read in a given system; and the studies exploring cognitive components of reading identify the specialized cognitive and metalinguistic processes essential for fluent reading.

All of these elements may develop differently if children are learning two languages in childhood instead of just one. If the oral proficiency needed for

reading requires specialized experiences rather than simple conversational fluency, then some of those experiences may be lacking in one of the languages of the bilingual child. The distinction between concepts of sound and print that are unique to each language may facilitate or impede bilingual children in their attempt to master the literate forms of one or both languages. The specialization of the cognitive and linguistic processes necessary for reading may be affected by the children's experience in learning two languages. If bilingualism influences children's initial access to literacy, then it is through the development of these foundational concepts that literacy is supported. The rationale for expecting such an effect is that the experience of acquiring and structuring two language systems can affect the child's development of these underlying concepts. Studies of children's progress in such skills as decoding are essential, of course, but by the time children are working through those stages of literacy development it is probably too late to find out if bilingualism on its own has affected their experience. The concern in the present review, therefore, is in how bilingualism influences the early developments that are the foundation for literacy.

Why should childhood bilingualism affect the way in which children acquire literacy in the early school years? Research with monolinguals has demonstrated that literacy builds out of (a) oral competence with the literary (discourse) forms of language, (b) conceptual development that includes understanding the symbolic notational systems of print, and (c) metalinguistic insights that allow children to achieve awareness of the phonological forms of language. Each of these background skills for literacy corresponds respectively to one of the three skills highlighted in the three areas of second language (L2)¹ research discussed above. More importantly, each of these has been shown to be influenced by bilingualism. To the extent that there is a relation between the establishment of these background skills and bilingualism, there may also be a relation between bilingualism and the ability of children to become literate.

The three aspects of second language literacy and the precursors to literacy in a first language are related through their common concepts. The first is oral proficiency in the language of literacy. It is important for monolingual children to have mastered the language sufficiently to support literacy; reading in a weak (second) language is hampered by inadequate linguistic control. Bilingual children will undoubtedly have different levels of oral proficiency in their different languages. The second is representational concepts of writing. Monolingual children must establish concepts of sound, word, and the function of print before they can read; because these units are different across languages, bilingual children must acquire the appropriate representations for each language they are learning to read. These differences set out different background requirements

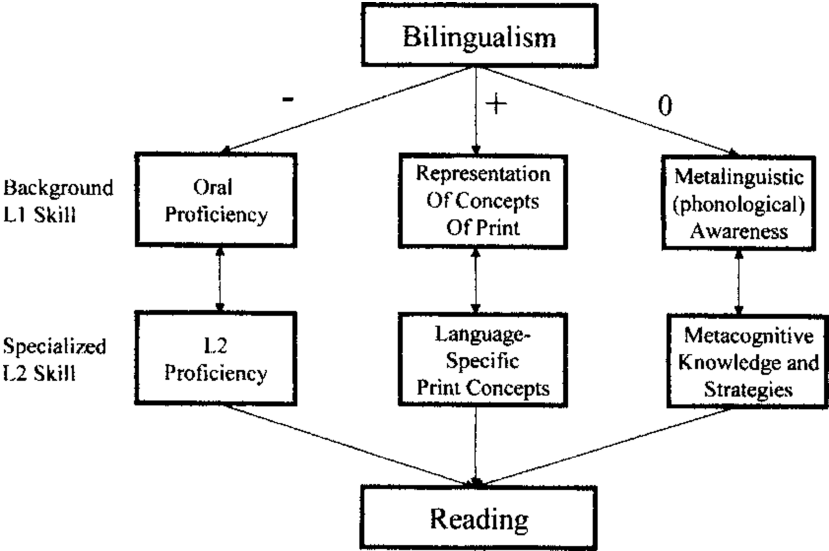


Figure 1 Relation between first- and second-language literacy acquisition and bilingualism.

for the preliteracy knowledge of bilingual children. The third is the metacognitive processes and strategies for reading. For monolingual children, the primary challenge for metalinguistic understanding is in phonological awareness; for second-language reading, it includes as well the strategies and insights (including phonological) that are specific to reading different languages. Bilingualism has previously been shown to enhance the development of such metalinguistic insights. These relationships are illustrated schematically in Figure 1. This diagram is not intended to be a model of reading but a description of the relationships among the background skills needed for reading in both a first (L1) and second language. No causal dynamic or ordered sequence is implied by the positioning of the L1 and L2 skills with respect to each other; rather, bilingual children must master both layers. Moreover, the order in which they master each is irrelevant, and progress in one language can influence progress in the other. That aspect is signified by the bidirectional arrows connecting these two sets of skills. As each of these skills develops, bilingualism may facilitate its acquisition, interfere with its establishment, or have no effect on its normal progress in preparing the child for literacy. The purpose of this review is to examine each of the three skills required by monolingual children in learning to read and consider their development by bilinguals. The overall impact of

bilingualism on children's ability to learn to read is ultimately the aggregate of its effect on these individual skills.

Language Proficiency

Does speaking two languages affect the way in which children will learn to read in at least one of them? Some implications of bilingualism on the acquisition of literacy are obvious. For example, learning to read in a weak language will undoubtedly be more difficult than grappling with the symbolic function of print in a more familiar language. Similarly, learning to read in a language that is written in a different script from the one practiced in preschool explorations of print will also impede children's progress. Further, early story experiences that are linguistically and culturally different from those that are the basis for the language in which children are learning to read might confuse children, ultimately slowing the progress for the child in gaining competence in literacy.

These are all examples of situations in which children's experience in one language may interfere with their ability to learn to read in another. Typically, the consequence of these factors is negative, although the delay created by them may be brief and easily overcome. But what about situations in which the child's two languages create no obvious obstacles to literacy? What is the effect of knowing two languages, to reasonable levels of competence, with no extraneous social or motivational factors preventing children from progressing from oral to literate mastery? Does oral competence in two languages have an impact on the way in which children learn to read? It is only for children who have developed acceptable levels of oral competence in both languages at the point at which literacy begins that the unique effect of bilingualism itself can be isolated. Therefore, to consider whether bilingualism influences the acquisition of literacy, the examination must focus on these children of linguistic privilege.

It is almost self-evident that children's competence in spoken language will provide some measure of prediction in determining how effectively they will learn to read. Children with higher levels of oral proficiency and more elaborated vocabulary read more easily than their less proficient peers (Adams, 1990). Garton and Pratt (1989) even suggested that learning to read facilitates the development of oral language proficiency. Dale and his colleagues studied children who were early talkers to determine whether their oral precocity propelled them into advantages in early schooling, especially regarding literacy. In the first study, conducted when these children were 4½ years old, they reported a few isolated advantages for these highly verbal children, the most notable being in their development of phonological awareness (Crain-Thoreson & Dale, 1992). In the second study, when these same children were 6½ years old, the

precocious talkers had significantly exceeded their peers in their reading level and increased the gap in their command of oral language (Dale, Crain-Thoreson, & Robinson, 1995). On average, the reading level of this group was 1½ years beyond their grade level. The relation with oral proficiency persists once reading is established: McBride-Chang and Chang (1995) reported a correlation between vocabulary and reading ability for 11-year-olds in China. Bilingual children may or may not have better oral competence than monolinguals, but they certainly have *different* oral competence. If the early experience of knowing two languages influences the acquisition of literacy, one avenue of that influence may be through the type of oral competence established by these children. Just as the precocious talkers enjoyed an overall advantage in learning to read, it may be that multiple talkers enjoy similar benefits.

Studies aimed more at instructional aspects of reading have confirmed a relation between children's vocabulary as an indicator of oral proficiency and achievement in learning to read. Stahl and Fairbanks (1986) conducted a meta-analysis of the relevant research and reported that instruction to increase children's vocabulary resulted in significantly higher levels of reading comprehension. In this respect, an aspect of proficiency in the spoken language directly affects the level of literacy that children will achieve. Again, these relations are based on monolingual children learning to read in their only language.

What happens when children control two oral systems and are learning to read in one of them? Carlisle, Beeman, Davis, and Spharim (1999) investigated the relationship between vocabulary (and other measures) and early reading for bilingual children who had poor command of their two languages. The participants were 57 Spanish–English bilingual children in grades 1–3 who were tested in both languages. The tests included receptive vocabulary, a definition task modeled after Snow (1990), and a phoneme deletion task (Rosner, 1975). A regression analysis with English reading comprehension as the dependent variable showed a significant effect of vocabulary in both languages, each accounting for about 15% of the variance, and phonological awareness in English, accounting for a further 6% of the variance. In other words, vocabulary mastery in Spanish helped predict reading comprehension in English. Studies with bilingual children without the handicap of weak language knowledge partially corroborate the results and report a modest role for oral proficiency in the first language as a predictor of word recognition skills in the second language (Durgunoğlu, Nagy, & Hancin-Bhatt, 1993; Geva & Siegel, 2000).

The study also examined the effect of bilingualism on these scores by calculating an interaction measure from the vocabulary assessments and entering that score into the regression analysis. This measure of bilingualism did not

add significantly to the explanation of the variance in reading comprehension. Reading proficiency was determined by the level of vocabulary development in each language and not by an overall assessment of how bilingual the child was. It is possible that the relevant factor underlying these relations is verbal ability—children with higher levels of verbal ability acquire wider vocabulary in both languages, and it is these children who also learn to read more easily, that is, the responsible factor for the correlation is the underlying variable of verbal ability.

The results of the Carlisle et al. (1999) study indicate that vocabulary size contributes to success on literacy-type tasks, but vocabulary is often depressed for bilinguals (Ben-Zeev, 1977; Bialystok, 1988; Merriman & Kutlesic, 1993; Rosenblum & Pinker, 1983; Umbel, Pearson, Fernández, & Oller, 1992). Some (limited) quantification of this point can be extracted by comparing the vocabulary size found by Pearson and Fernández (1994) in a study of bilingual Spanish–English children between the ages of 18 and 24 months with the published norms for this age reported by Fenson et al. (1993). These data are reported in Figure 2. The bilingual data were inferred from the original study by extracting the vocabulary size individually for each of the 18 children in the study from the published graphs. The bilingual vocabulary is their vocabulary in the stronger language and the total vocabulary is the combined lexicon across both languages. In a review of several studies, Rickard Liow (1999) confirmed that weak oral language skills compromise reading ability for bilingual children in Singapore. The evidence linking oral vocabulary to reading

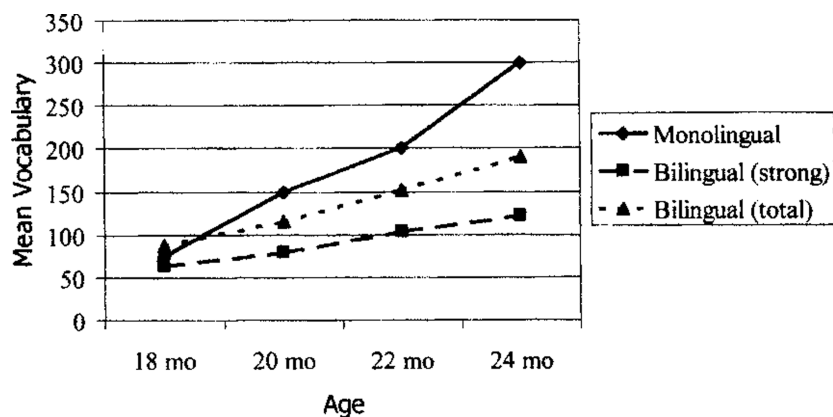


Figure 2 Vocabulary development in monolingual (from Fenson et al., 1993) and Spanish–English bilingual (from Pearson & Fernández, 1994) children.

is consistent with the conclusion that the reduced oral proficiency of bilingual children is a disadvantage in the acquisition of reading.

The influence of oral proficiency on learning to read extends to mastery of specialized forms of language. One aspect of oral competence that has repeatedly been shown to promote the acquisition of literacy is the command of literate language that follows from experience with early storybook reading. Grasp of literate language has been identified as the source of the positive relation between preschool children's exposure to storybooks and successful literacy outcomes (Dickinson, De Temple, Hirschler, & Smith, 1992; Snow & Tabors, 1993; Wells, 1985). What children learn in these encounters with books is the structure of the literary register (Purcell-Gates, 1988), and competence with this linguistic form is predictive of the development of literacy achievement.

Preschool children who have oral command of two languages may or may not have the same opportunities to experience the written forms of both. In that case, they may have limited exposure to the literary register in one of the languages, making the impact of bilingualism on learning to read dependent on the transferability of the literary register across languages. If this competence does transfer, then bilingual children with storybook experience in only one of their languages will have an advantage in learning to read the other, because a foundational skill has already been learned. There may even be a facilitative effect from cumulative mastery if storybook experience is available in both languages. Transfer across the two languages of bilingual children has been shown with such other specialized linguistic skills as metaphor interpretation (Johnson, 1989), formal definitions (Snow, 1990), and academic language (Cummins, 1991), supporting the prediction that competence with the literary register might also transfer. However, if mastery of the literary register is learned individually for each language encountered in print, then, at least for this background skill, bilingualism will confer no special advantage (or deficit), as the relation with literacy acquisition is language-specific. Children would need to build up the basis of literacy individually for each of their languages.

Herman (1996) examined these possibilities in a study of 94 French-English bilingual kindergarten children who had roughly equivalent oral competence in both languages. The children lived in English-speaking neighborhoods and often heard English at home but were being educated in French. These are not immersion schools but, rather, French language schools established for the French-speaking community. The task battery included the mock reading task (using *Frog, Where Are You?*) in which children created a story from the pages of a wordless picture book. Additionally, measures were obtained for

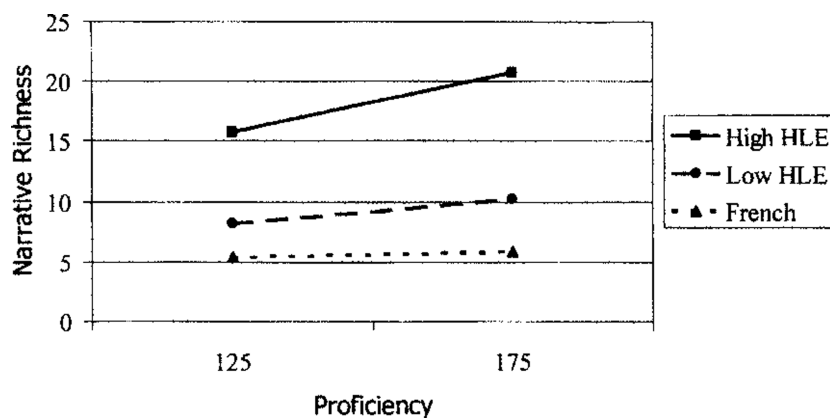


Figure 3 Relation between proficiency and Home Language Environment (HLE) in English on mock reading task.

oral proficiency (a composite score computed from the standardized Peabody Picture Vocabulary Test (PPVT) and a conversation task) and various metalinguistic measures. All testing was conducted in both languages. Unfortunately, the school insisted that all tasks had to be administered in French first, creating potential order effects favoring the English scores. This may have occurred in the mock reading task. All of the children scored higher in English, possibly because their experience with this book in French familiarized them with the story (shown in Figure 3). Parents also completed a questionnaire that explained the patterns of language use in the home and the types of language, and particularly literary language, to which children were exposed in each language.

A set of regression analyses was constructed to determine the influence of the independent measures on children's success with the mock reading task. The results showed different patterns for each of the two languages. In French, narrative richness in the mock reading task was significantly (but modestly) predicted by oral proficiency in French, accounting for 7% of the variance. In English, the regression analysis showed that the mock reading score was dependent on an interaction between oral proficiency in English and home language environment, a variable that indicated the extent to which English was used at home. The interaction was that the effect of oral proficiency on mock reading scores was significantly greater for children from homes with wider exposure to English than from those with a more restricted English experience. This model accounted for 17% of the variance. Not only did each proficiency and home language environment influence mock reading scores, but also the

effect of home language environment on narrative richness was more dramatic among children of high English proficiency than among their peers with lower English proficiency scores. Children with higher levels of English proficiency, in other words, profited disproportionately from increased exposure to English at home. Although the French stories obtained lower scores than the English stories, there was no interaction between the quality of the story and the level of language proficiency as there was for English. These relationships are shown in Figure 3.

All of the children were attending French kindergarten, so all of the children heard daily stories in French. What distinguished among their experiences was the amount of exposure children received in literary English. The regression analyses showed that for children who had higher levels of English at home, scores were higher on the mock reading task. The advantage was increased for children who began with higher levels of oral language proficiency. The reason is that home was the only opportunity for children to be exposed to stories in English, and the extent of this exposure determined the richness with which children could create their own stories from a picture book. The more equivalent exposure to French stories enjoyed by all of the children ensured as well a more equivalent baseline of competence in creating French stories.

The distinctness of children's story performance in each of the languages is illustrated as well by analyses of cross-linguistic relations that emerged in the results. These analyses showed little benefit from one language onto the other. As Herman pointed out, the specific discourse demands, structures, and nuances in each language require children to learn these conventions individually and build up their literary register for each language separately. It is this literary register that will guide children into literacy in that language.

The role of language-specific experience obtained by exposure to English at home in determining the richness of children's stories in English, and the absence of cross-language transfer of skill in the two story tasks, points to the conclusion that this aspect of literacy preparation develops individually for children's languages. In that case, there can be no influence of bilingualism as an additional factor, because knowledge of the child's other language did not impact upon his or her ability to demonstrate competence with the literary register in the other. Instead, it is preparation in the literary forms of a specific language that help to promote children's path into literacy.

For both measures of vocabulary size and knowledge of literary forms, the relation between the competence of bilingual children and reading outcomes is tied to specific experiences in each language. Vocabulary develops individually for the bilingual child's two languages, and children's vocabulary must be

adequate in the language for which literacy is acquired. Although some evidence supports facilitation of oral competence across languages into reading, the bulk of the evidence indicates that reading is compromised if oral skills in *that language* are inadequate, and the tendency is for bilingual children to have diminished oral mastery in each of their languages. Competence with the literate structure of language that is the basis for text is acquired individually as a function of experience in each language. Children must establish the literary basis of their linguistic competence individually for their different languages; oral proficiency in general provides no privileged access to literacy for bilingual children. To the extent that bilingualism depresses oral proficiency in one language, it may also compromise learning to read in that language.

Conceptual Development

Long before children are able to read independently, and before they understand the decoding principles upon which reading is based, they know a lot about the formal properties of print. Their knowledge includes the routines around reading and the mechanics of how books are read (Snow & Ninio, 1986), the role of print and some knowledge of its properties (Bialystok, 1995; Ferreiro, 1984), and the difference between print and other notations (Tolchinsky-Landsmann & Karmiloff-Smith, 1992). These insights set the background against which children eventually discover how the print on the page encodes meaning and acquire the skill of uncovering that meaning independently. This move into independent reading, therefore, depends on shaping their early and often erroneous notions of print into the symbolic forms that are the basis of reading.

Concept of print is the understanding of the constituent notations that comprise the writing system and how those notations represent spoken language. In alphabetic languages, the writing system is made up of letters, the letters signify sounds, and those sounds are combined to reveal the words of the text. Children's progress in reading these languages is widely attributable to their explicit knowledge of these phoneme-grapheme structures (e.g., Liberman & Shankweiler, 1991). In nonalphabetic languages, different principles apply. Chinese writing, for example, consists of characters that contain both semantic and (unreliable) phonetic elements. Most children learning to read Chinese (and many adult fluent readers), however, approach characters in terms of their constituent but meaningless strokes and their reasonably reliable semantic radicals. Although reading instruction normally entails holistic memorization of characters, Chan and Nunes (1998) have shown that children in Hong Kong become sensitive to the rule-based structure of the semantic and phonological radicals that comprise the characters. Other languages, such as Korean and Japanese, exploit the

syllabic structure of words and record those units through notations that signify consonant-vowel combinations (Akita & Hatano, 1999). Children learning to read in any of these languages must learn both the general symbolic principle by which notational forms can be used conventionally to represent meanings and the specific correspondence principle by which the relation between form and meaning is expressed in that language or writing system. The correspondence principles children learn for one language may or may not prepare them to read in another.

Understanding the concept of print transforms knowledge of a formal system based on visual features into a symbolic system that can be used computationally. At the time that children know the constituents, such as being able to recite the alphabet and name the printed letters, their knowledge of those forms may not be represented as a functional symbolic system (Bialystok, 1991, 1995). Instead, children think of letters as visual forms, and if they relate at all to the meanings of the text, it is through some perceptual feature of the letters such as their size, shape, or numerosity (Ferreiro, 1983, 1984; Tolchinsky-Landsmann & Levin, 1985). For this reason, children who appear to know the properties of print are not yet ready to read. Therefore, a crucial preparation for literacy is establishing the forms of the writing system as symbolic knowledge capable of representing meanings.

The transformation of the knowledge of forms into symbolic concepts is a testable developmental achievement. If bilingual children construct these symbolic representations more readily than comparable monolinguals, then they will be more prepared for reading. Although there is little reason to expect that bilingual children represent information differently from monolinguals in general, their knowledge of two languages may change the way in which they represent linguistic information. Such differences may promote a more explicit representational structure that facilitates connecting the learned visual forms with the abstract linguistic features that they denote. In that case, concepts of print may come more easily to bilingual children.

The concepts of print needed for reading, however, are determined by the specific language and the writing system used for that language. Even for different languages written in the same kind of system (e.g., two alphabetic languages), children are able to discover these essential relations with different ease because of such differences as orthographic transparency (e.g., Goswami, 1999). Therefore, in addition to the possibility of a general bilingual effect on the development of symbolic concepts of print, there may also be specific effects that derive from individual language pairs or certain writing systems and their contrasts.

In a series of studies, we investigated the acquisition of two aspects of the symbolic concept of print in preliterate monolingual and bilingual preschool children who were 4 and 5 years old. The bilingual children spoke different language pairs across the studies, and the relation between the writing systems of the two languages was systematically manipulated. The focus of the studies was on the concepts required for reading in an alphabetic language, although data were collected about the preparatory concepts used in children's other language as well. Children were equated on a series of tasks assessing working memory, receptive vocabulary in English, and nonverbal intelligence.

The first concept of print investigated in these studies is the understanding that the notational forms are invariant representations of meaning. Once a notation is accepted as a symbolic written form, then the meaning that it signifies is fixed. The printed form "dog" cannot be taken to represent "cat" (unless under playful or unusual circumstances), and the reduced form "do" no longer signifies a canine. This invariance applies equally to all written forms, irrespective of the writing system and irrespective of the set of meanings they are encoding. The constraint is part of a restriction on any notational form: It applies equally to numbers, where "3" always indicates a specific quantity, and to maps, where "↑" always indicates a specific direction. Therefore, all children learning to read in any language and in any writing system must accept the invariance of print as a precondition for learning how to decode the text.

The second concept is the set of correspondences between forms and referents that are used in individual writing systems. In alphabetic systems, letters make sounds, so the mapping from forms to meanings is through phonemes. Other systems indicate different correspondences. What is common is that there is always a set of rules that provides the basis for the computational aspects of reading, even though the rules themselves may be very different. Therefore, as part of learning the concepts of print, children must also learn the correspondence rules that relate the forms to the meaning of the text. In this case, the general requirement to learn such a system is common to all children learning all languages, but the specific rules that they will master depend on the language in which they are entering literacy.

Our studies of the acquisition of these two concepts of print revealed a different role for bilingualism in each. All of the children in the studies were selected by means of a screening procedure that assured that they knew the alphabet and could name letters and their respective sounds, even though they could not yet read. For bilingual children, all of the tasks were repeated in both languages. In one study, the bilingual children were French–English and Chinese–English bilinguals (Bialystok, 1997); in the other study, the

bilingual children were Hebrew-English bilinguals (Bialystok, Shenfield, & Codd, 2000).

The notion of invariance was investigated by using the moving word task. The experimenter showed children pictures of two common objects and named them (e.g., a king and a bird). Then a card was introduced on which was printed the name of one of the pictures: "This card has the word *king* on it. I'm going to put the card right here." The card was placed under the picture it named, although that correspondence was never explicitly drawn to the child's attention. The child was asked what was written on the card. Some confusion then erupted, during which the card was "accidentally" displaced so that it was under the other picture. Then the child was asked for the second time what was written on the card. The experimenter then noticed that the materials had been changed, commented on it to the child while returning the card to its original position, and asked the child for the third time what was written on the card.

If children understand the invariance of print, then they will know that the contiguity between the card and one of the pictures is irrelevant. The important response, therefore, is the one produced when the card is under the wrong picture. Monolingual preschoolers provided the correct response to this item approximately 45% of the time, but comparable bilinguals were correct about 80% of the time. These results were consistent for all the children, and there were no differences among the bilinguals as a function of their language pairs. Some of the data are shown in Figure 4.

The second concept, the correspondence by which the print carries meaning, was investigated with the word size task. The task is based on the alphabetic

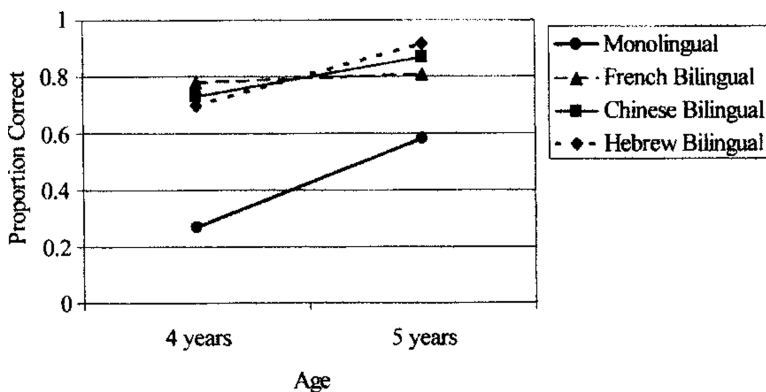


Figure 4 Mean proportion correct on inconsistent question in moving word task by age and language group.

principle: Words that have more sounds need more letters to represent those sounds. Therefore, long words must be written with more letters than shorter words. Children were again shown two pictures of common objects, one of which had a long name (at least three syllables) and the other had a short monosyllabic name. The pictures were named, and then the experimenter gave the child two cards, pointing out that each card had one of the names on it. Children had to match the printed card with the appropriate picture. For half of the items, there was incongruity between the size of the word and the size of the object it named. For example, in the pair *car-butterfly*, the longer word names the smaller object. The only reliable way of correctly matching the words is by judging the relative length of the spoken and printed forms, a strategy that would only occur to children who understood that letter-sound correspondences were the key to determining the meaning of a printed word.

The relevant items in this task are the incongruent ones in which the object size conflicts with the word size. These items were very difficult, and none of the 4-year-olds in any of the studies was able to perform better than chance. More important, however, is that children's performance depended both on being bilingual and on the writing system used in the other (non-English) language. The French-English bilinguals obtained exactly the same scores as their monolingual peers, in spite of outperforming them in the moving word task. Although these bilingual children spoke two different languages, their early print experiences in both languages were the same, requiring mastery of the same alphabetic system based on the same correspondence rules. In contrast, the Chinese-English bilinguals and Hebrew-English bilinguals scored significantly better than either the monolinguals or the French-English bilinguals on the word size task (Bialystok, 1997; Bialystok, Shenfield, & Codd, 2000). These data are shown in Figure 5.

These studies demonstrate that developing the concepts of print that support reading is influenced both by bilingualism and by the specific language and writing system used in the bilingual child's two languages. All of the bilingual children were more aware than monolinguals about the invariance of print. This insight might follow from their experience in seeing that texts written in different ways still lead to consistent stories. In contrast, learning the correspondence principles of print in two languages came more easily only to those children who were exploring two different writing systems. These effects were found in both of the bilinguals' languages, and scores were always the same in both languages. These insights differ in complexity. The invariance of print can be understood with no attention to the details of how the system carries meanings, but the correspondence of print and meanings requires a more analytic understanding.

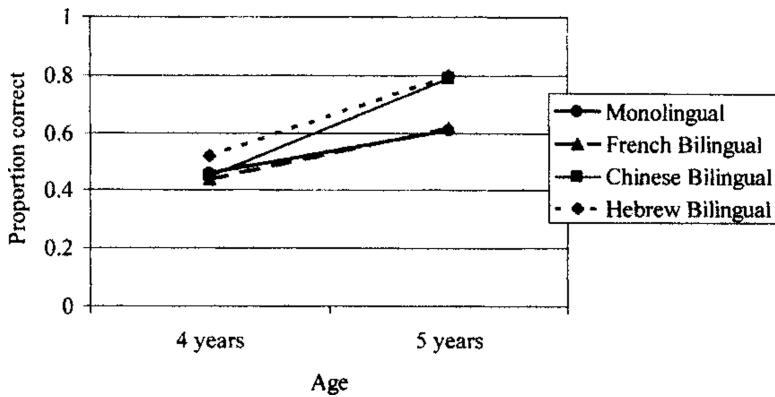


Figure 5 Mean proportion correct on incongruent items in words size task by age and language group.

Nonetheless, bilingualism never led to any disadvantages in children's efforts to establish the concepts of print needed for learning to read. The overwhelming effect of bilingualism is to enhance the extraction of these concepts in most cases.

Metalinguistic Insights

Metalinguistic notions of structure, word, and sound underlie children's ability to become literate (reviewed by Adams, 1990). Francis (1999) extended this research by examining some of the complexities of these relationships for bilingual children, noting how bilingualism modulates the effect that metalinguistic awareness brings to literacy acquisition. Although no simple conclusions followed, he argued that specific aspects of metalinguistic awareness in one of the languages influenced reading comprehension in the other for bilingual children. To the extent that metalinguistic concepts define children's understanding of language and its structure, an experience that alters the construction of those concepts can potentially alter as well the way in which children can apply their knowledge of language to the forms of literacy.

Phonological awareness is the metalinguistic concept most clearly connected to reading. Its role in initiating and promoting literacy in children has been documented in countless empirical studies (e.g., Bryant & Goswami, 1987; Liberman, Shankweiler, Liberman, Fowler, & Fischer, 1977; Morais, 1987; Perfetti, Beck, Bell, & Hughes, 1988; Wagner, Torgesen, & Rashotte, 1994). Contrary to earlier claims that limited its effect to alphabetic literacy (Perfetti & Zhang, 1991; Read, Yun-Fei, Hong-Yin, & Bao-Qing, 1986), researchers now

propose that it is also essential in learning to read nonalphabetic languages such as Chinese (Hanley, Tzeng, & Huang, 1999; Ho & Bryant, 1997a, 1997b; Shu, Anderson, & Wu, 2000), although these claims tend to be based on tasks assessing units larger than individual phonemes. It is surprising, therefore, how little research has investigated whether phonological awareness follows a privileged developmental path in bilingual children. If it did, then that would be a compelling reason to expect bilingual children to move more easily into literacy than monolinguals. The possibility is supported by research showing advantages to bilinguals in other aspects of metalinguistic development (Ben-Zeev, 1977; Bialystok, 1986, 1988; Bowey, 1988; Cummins, 1978; Edwards & Christophersen, 1988; Galambos & Goldin-Meadow, 1990; Galambos & Hakuta, 1988; Smith & Tager-Flusberg, 1982).

Children's development of awareness of phonological structure is responsive to the structure of individual languages (reviewed by Tolchinsky & Teberosky, 1998). Cossu, Shankweiler, Liberman, Katz, and Tola (1988) found higher levels of competence in phonological awareness tasks for Italian-speaking children than for English-speaking children, presumably because of the greater phonological transparency of Italian. Bruck and Genesee (1995) attributed an advantage in syllable awareness to children who spoke French but phoneme awareness to children who were educated in English. Caravolas and Bruck (1993) compared the development of phonological awareness in children who spoke Czech with those who spoke English. They found that Czech-speaking children were better than English-speaking children in isolating consonants in clusters appearing in nonsense words, indicating greater awareness of complex consonants. English-speaking children, in contrast, performed better on simpler consonant problems. Czech has complex consonant clusters but completely regular spelling patterns, and this may have facilitated children's ability to identify individual consonant phonemes. Gonzalez and Garcia (1995) explored specific phonological properties of Spanish and their relation to phonological awareness. They investigated phonemic sensitivity across different levels of analysis, such as syllable and phoneme, and found different developmental patterns for each. Language-specific differences in phonemic sensitivity are pervasive.

If different languages foster different levels of phonological awareness, and phonological awareness transfers across languages, then bilingual children who speak languages that differ in their accessibility to phonological structure may benefit by transferring their metalinguistic understanding of one language to their other one. This enhancement may have an overall facilitating effect on the acquisition of literacy. Does phonological awareness transfer across languages?

Some support for this possibility is found in a longitudinal study by Ciscero and Royer (1995). Their participants were children who had various mixtures of competence in Spanish and English and were in kindergarten and grade 1 at the two testing times. The children were asked to judge whether pairs of words matched on rhyme, initial phoneme, or final phoneme. The data are weak but offer some evidence that performance on the initial phoneme task in kindergarten predicted performance on the same task in grade 1 for the opposite language. Hence, children who were more adept at isolating the initial sound of a word in kindergarten were generally better in this skill and could apply it to a different language a year later.

A more rigorous study of this question was undertaken by Durgunoğlu et al. (1993). Their subjects were also learning Spanish and English, but children's proficiency in each language was more closely monitored in this study. All of the children were native speakers of Spanish and were learning to read in English, their second language. The results showed that phonological awareness and word recognition in Spanish predicted word recognition in English, the second language. Extending this research, Durgunoğlu (1998) has reported strong correlations between phonological awareness in English and Spanish for bilingual children and significant influences between phonological awareness and word recognition across languages. In other words, the phonological awareness skills developed in one language transferred to reading ability in another language. This is an important result: If children can establish basic concepts of phonological awareness in any language, then reading will be facilitated irrespective of the language in which initial literacy instruction occurs.

Finally, indirect evidence for the transfer of phonological awareness can be inferred from a study by Rickard Liow and Poon (1998). They examined children's phonological awareness in English as a function of the child's knowledge of another specific language. The study was conducted in Singapore, and all children were attending school in English. The children's home language was English, Chinese, or Bahasa Indonesian, a language written alphabetically with a regular (shallow) orthography. Children in this last group scored highest on English tests of spelling designed to measure phonological awareness. This success was at least partly attributable to the transfer of phonological insights derived from a phonologically simple language, Bahasa Indonesian, and transferred to English.

A small number of studies has examined the development of phonological awareness in bilingual children, but the studies use different kinds of bilingual populations, administer different phonological tasks, and report different outcomes. A summary of some of these studies is presented in Table 1. Bruck

Table 1 Summary of some studies of bilingual phonological awareness

Study	Ages	Bilinguals	Degree	Tasks	Results
Yelland, Pollard, & Mercuri	K Gd 1	Limited Italian	Partial	Word size	B > M B = M
Bruck & Genesee	K Gd 1	French immersion	Partial	9 tasks	B > M B = M
Campbell & Sais	K	Italian–English	Full	4 tasks	B > M

and Genesee (1995), for example, compared monolinguals and early bilinguals longitudinally from kindergarten to first grade on a variety of tasks. They found an advantage for the bilingual children on onset-rime segmentation in kindergarten, but it disappeared in grade 1. In the first grade, there was an advantage for the monolingual children on a phoneme-counting task. Using children whose bilingualism was even more limited, Yelland, Pollard, and Mercuri (1993) asked children to judge whether pictured objects had long names or short names. They found an advantage for bilinguals in kindergarten but it disappeared by the end of grade 1. Finally, Campbell and Sais (1995) administered four different tasks to preschool Italian–English bilinguals. The tasks made limited demands on phonological awareness: match words for initial sounds or meanings and delete morphemes from compound words. They reported a bilingual advantage, but because they did not test children in grade 1, it is unclear whether these advantages were sustained.

Two patterns emerge from these studies. First, if there are bilingual advantages (or differences in either direction), they are found on only some of the measures used. Therefore, the specific task rather than a global assessment of phonological awareness determines the outcome. Tasks differ in both the phonological unit they assess (syllable, rime, phoneme) and the cognitive demands they impose. Second, the bilingual advantages that were found occurred in kindergarten and usually disappeared by first grade. This might be because the introduction of formal reading instruction provided an equalizing experience for all the children, removing any initial advantage that the bilinguals might have demonstrated. Bruck and Genesee (1995) suggested further that it is not only the fact of literacy instruction but also the language in which literacy instruction occurs that determines these outcomes.

We explored these patterns in a series of three studies examining the development of a range of phonological awareness tasks in monolingual and bilingual children from kindergarten to second grade (Bialystok, Majumder, & Martin,

2003). The bilingual children were chosen so that they were reasonably balanced in their mastery of both languages. The tasks ranged in complexity and in the aspect of phonology that was required for their solution. The most complex of these was the phoneme substitution task, modeled after a task developed by Stanovich, Cunningham, and Cramer (1984). The task was to replace the first sound in a target word with the first sound from another word to produce a new word. For example, the word “cat” could be converted to “mat” by substituting the first sound of “mop” into the target word. Children were told, “Take away the /k/ sound from ‘cat’ and put in the /m/ sound from ‘mop’. What is the new word?” Kindergarten children could solve these problems to some level of competence, but large improvements were recorded across the next two grades. However, in all of the studies and for all of grades, there were no differences between monolinguals and bilinguals.

A different pattern was found in a phoneme segmentation task. Children were given a set of counters, trained on the procedure, and asked to figure out the number of phonemes in common words. Three groups of children participated—monolinguals, Chinese–English bilinguals, and Spanish–English bilinguals. All of the children were in grades 1 or 2 (the task is too difficult for children in kindergarten). The three groups were reliably different from each other: Spanish bilinguals scored the highest and Chinese bilinguals scored the lowest, with all intergroup differences being significant. These data are shown in Figure 6. It is possible that the greater similarity between Spanish and English enabled children to proceed more efficiently in analyzing the sound system of spoken

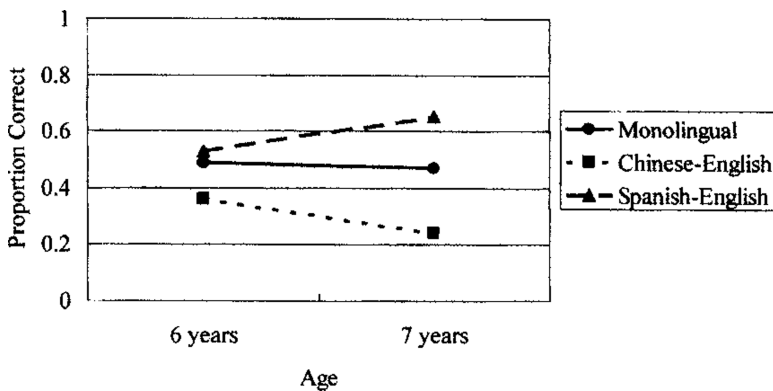


Figure 6 Proportion correct in phoneme segmentation task by age and language group.

language. As shown by both Ciscero and Royer (1995) and Durgunoğlu et al. (1993), phonological awareness in Spanish transfers to English.

The research seeking bilingual advantages in phonological awareness has produced a variable set of effects and a list of conditions on when those effects might occur. There is some advantage to bilingual children in learning about the sound structure of spoken language, but the advantage is mitigated by the age of the children (which is likely confounded with literacy instruction), the nature of the task, and the language pairs in the bilingual mix. Bilingualism itself appears not to fundamentally alter the development of phonological awareness.

The consistent role of grade in determining the outcome suggests that pedagogical factors might be at least as important as linguistic ones in promoting phonological awareness. In some studies, there are phonological awareness advantages for bilinguals in kindergarten, virtually never any differences between the groups in grade 1, and a reemergence of differences in grade 2. The most sensitive time for the development of phonological awareness is probably in the first grade, when reading instruction is the main agenda. This designation is consistent with descriptions in which phonological awareness and literacy are considered as interactive concepts, each promoting further development of the other (e.g., Morais, Bertelson, Cary, & Alegria, 1986). In that case, the educational experience of reading instruction eradicates the majority of individual differences brought by personal factors such as bilingualism. These individual factors may distinguish among children before reading instruction begins (kindergarten) and reemerge when children are progressing toward fluent reading (grade 2), but are relatively minor during the time that children are focused on learning the skills of reading. These studies point to the importance of variables besides bilingualism that are crucial in establishing children's level of phonological awareness. Overall, the role of bilingualism alone is probably neutral in children's development of the phonological awareness skills necessary for reading.

Reading Bilinguals

Each of the reviewed background skills provides a critical part of the foundation on which children become literate. In each case, the development of that skill by bilingual children is potentially different from that of monolinguals. Therefore, differences in the development of these skills by bilingual children may affect the ease or efficiency with which bilingual children learn to read.

Each of the three skills stands in a different relation to bilingualism and to reading in one or both languages. Some skills show facilitative transfer, some

need to be constructed individually, and others are impervious to the fact that the child has two languages. As shown in Figure 1, the line of influence from bilingualism to reading diverges into three strands and passes through two layers of development. The dynamic is that bilingualism permeates the development of all of the subskills that lead to literacy and in this respect changes its developmental course. The overall nature of effect is indicated in the figure by the designation of “+” (positive), “-” (negative), or “0” (neutral) next to the line extending from bilingualism to the reading skill. The different pattern for each of the three skills is not necessarily contradictory. Each of the skills may affect different aspects of reading; for example, oral proficiency influencing comprehension, concepts of print affecting decoding, and metalinguistic strategies impacting on word recognition. All of these are part of reading and literacy, and all of them are in some way influenced by bilingualism.

For oral proficiency, experiences with the textual forms and adequate vocabulary need to be established individually for each language for reading to follow. If bilingualism has any effect, it is as a deterrent because bilingual children have a more difficult time in building up sufficient oral mastery and reading experience in each language. Hence, the effect of bilingualism on establishing oral proficiency is considered overall to be negative. For concepts of print, the general effect is for a benefit to bilingual children in understanding the symbolic function of notations, even though some of these concepts require experience with two different writing systems. Finally, the development of phonological awareness depends on the languages the child speaks, the phonological relation between those languages, the tasks used to assess awareness, and experiences with literacy instruction. These factors, in conjunction with some studies showing disadvantages for bilingual children in some cases, indicate that there is no overriding effect of bilingualism on developing phonological awareness, because other factors predominate in their importance. Hence, this relation is described as neutral.

Is there a contradiction between the position that bilingualism exerts a broad but limited influence on literacy development and that the majority of variability resides in specific effects created by languages, tasks, and experiences that differentially influence the subcomponents of literacy? The two views may be compatible. Larivée, Normandeau, and Parent (2000) described a similar potential conflict in developmental theorizing between Piaget’s macrogenetic model based on structural stages and microgenetic accounts of individuality. Piaget’s concern was with a biological conception of structure that captured universality across diversity. Thus, his notion of *structure d’ensemble* explains general developmental variability but fails to account for the specific processes and

variability that are better explained by local information-processing models. Their solution is a pluralistic model that allows for both types of systematic influence. Similarly, bilingualism is not a holistic experience that exerts a single impact on development. Instead, within the context of bilingual development (general effect), individual influences of language, age, and task can be identified for their systematic contribution to development (specific effect). Bilingualism might be a necessary condition for the efficient development of advanced literacy, but it is not a sufficient condition. The local effects are governed by the structure of specific languages and writing systems, the exposure to instruction in literacy, and the cognitive baggage invoked by the task used to measure the skill.

Although there is no single and generalized effect of bilingualism on the development of these background skills, there are important differences in the way that each of these concepts is acquired by bilingual children. For that reason alone, bilingualism inevitably impacts on children's ultimate acquisition of literacy. Aside from these details, however, two broad consequences of bilingualism are noteworthy. First, both the ability to read and some of the components of reading that prepare children for that ability transfer across languages and systems. Therefore, children who have learned skills in one language can potentially benefit from that mastery by applying them to the other. Even though such transfer is neither automatic nor assured, it does happen, and the consequences are always salutary. Second, the differences between monolinguals and bilinguals that occur are invariably to the benefit of the bilinguals. Knowing more has never been a disadvantage when compared to knowing less.

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Note

- 1 The second area of research, which investigates learning to read in different languages, is not strictly L2 research but for simplicity will be considered as part of this group.

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